

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings includes changes to Figs. 1, 6, 7 and 9.

Attachment: Replacement sheet
 Annotated sheet showing changes

REMARKS

Applicants thank the Examiner for total consideration given the present application. Claims 1-24 are currently pending of which claims 1, 9, and 17 are independent. Claims 1-24 have been amended through this Reply. Applicants respectfully request reconsideration of the rejected claims in light of the amendment and remarks presented herein, and earnestly seek timely allowance of all pending claims.

AMENDMENT

Claims 1-24 have been amended merely to address informal issues and to enhance clarity. It is intended that the scope of the claims remain substantially the same. Upon careful review, one would conclude that the amendments made to the Specification and claims do not add any new matter to the application and they are not narrowing, and are not made for a reason relating to patentability. Accordingly, it is submitted that these amendments do not give rise to estoppel and, in future analysis, claims 1-24 are entitled to their full range of equivalents.

FORM 1449 ACKNOWLEDGMENT REQUESTED

It is noted that the Examiner has not considered the Uchiyama (CA) reference since no copy was provided. Applicants respectfully submit that the above-identified reference has been previously cited or submitted to the Office in the PCT/JP03/11706 filed on September 12, 2003 which has been relied upon for an earlier filing date under 35 U.S.C. 371. The prior indication of relying upon this reference for an earlier filing date under 35 U.S.C. 120 was an inadvertent error. Accordingly, Applicants respectfully request the Examiner to consider the Uchiyama (CA) reference and provide an initialed copy of the PTO-1449 for the present application.

OBJECTION TO THE SPECIFICATION

The Specification is objected to for minor informalities. *See Office Action, items 6 and 7.* The Specification has been amended to address this objection. Accordingly, Applicants respectfully request that the objection to the Specification be withdrawn.

DRAWINGS

1) The Examiner objected to the drawings because Fig. 9 allegedly should have been designated by a legend such as "PRIOR ART". Drawing corrections are filed concurrently herewith in which the legend "CONVENTIONAL ART" has been added to Fig. 9.

2) The Examiner alleges that the drawings are objected to because reference characters "10" and "30"; "11" and "31"; "13" and "34"; and "15" and "35" have been used to designate PARITY CHECK MATRIX CREATION UNIT; RANDOM NUMBER GENERATION UNIT; PUBLIC COMMUNICATION PATH COMMUNICATION UNIT AND COMMON KEY CREATION UNIT, respectively (Figs. 1 and 7). Applicants respectfully disagree. The Specification is clear in that reference characters "10", "11", "13", and "15" designate a PARITY CHECK MATRIX CREATION UNIT, a RANDOM NUMBER GENERATION UNIT, a PUBLIC COMMUNICATION PATH COMMUNICATION UNIT AND a COMMON KEY CREATION UNIT, respectively, in the communication apparatus on the transmission side (transmission device) in the quantum cryptosystem. Whereas, reference characters "30", "31", "33", and "35" designate a PARITY CHECK MATRIX CREATION UNIT, a RANDOM NUMBER GENERATION UNIT, a PUBLIC COMMUNICATION PATH COMMUNICATION UNIT AND a COMMON KEY CREATION UNIT, respectively, in the communication apparatus on the reception side (receiving device) in the quantum cryptosystem. Thus, no amendment has been made with regard to these reference characters.

3) The Examiner also alleges that the drawings are objected to because reference characters "S1" and "S11" have been used to designate CREATE H, G, G^{-1} (Figs. 2A and 2B). Fig. 2A depicts a process procedure performed by the communication apparatus on the transmission side and Fig. 2B depicts a process procedure performed by the communication apparatus on the reception side. Thus, it is clear that "S1" designates the step CREATE H, G, G^{-1} on the transmission side and "S11" designates the step CREATE H, G, G^{-1} on the reception side. Thus, no amendment has been made with regard to these reference characters.

4) The Examiner further alleges that the reference character "1a" as shown in Fig. 7 is not mentioned in the description. Fig. 7 has been amended to replace "1a" with "1".

5) The Examiner alleges that Figs. 1 and 7 are objected to for containing inadvertent typographical errors. Figs. 1, 7, as well as Fig. 6, have been amended to correct such inadvertent typographical errors.

In view of the above, it is respectfully requested to withdraw the objections to the drawings.

CLAIM OBJECTIONS

Claims 1-8 and 10-24 are objected to because of minor informalities. These claims have been amended to correct such minor informalities. Accordingly, it is respectfully requested to withdraw this objection.

Claim Rejection - 35 U.S.C. § 101

A. Claims 10 and 18 stand rejected under 35 U.S.C. § 101 as allegedly being not supported by either a specific and substantial asserted utility or a well-established utility. Applicants respectfully disagree.

Applicants point out that MPEP § 2107 sets forth guidelines for the examination of patent applications under the "Utility Requirement". Under MPEP 2107, an invention is "useful" when the utility is specific, substantial, and a credible. A utility is specific, if it is particular to the subject matter claimed. A substantial utility is found if one skilled in the art can use the claimed invention in a manner which provides some immediate benefit to the public. A credible utility is found if a person of ordinary skill in the art would accept that the recited or disclosed invention is currently available for such use. See MPEP 2107.

Applicants respectfully submit that the claimed invention satisfies the three-pronged test of "utility requirement" mentioned above. The claimed invention is directed to a specific subject

matter which includes a communication apparatus on transmission side that transmits photons onto a quantum communication path (claim 10) and a communication apparatus on reception side (claim 18). Such apparatus clearly provides a substantial utility since it provides a "real world" use by providing a practical application such as creating a highly-secured common key while correcting data error on a transmission path by an error correction code having remarkably high characteristics. (*See page 7, lines 8-11.*)

This utility is also credible since a person of ordinary skill in the art would accept that the recited or disclosed invention is currently available for such use. In the conventional quantum key distribution method and apparatus, when an error is present, the common data (common key) is discarded because an intercepting action is presumed to be present. Therefore, there is a problem that creation efficiency of the common key is correspondingly affected in some transmission paths. Further, in the conventional quantum key distribution method and apparatus which corrects data errors on the transmission path, large amounts of exchanges of the parity are generated for specifying the error bit, and the error correction processing is also performed in a predetermined times by the random permutation. Therefore, there is also a problem that a long period of time is required for the error correction processing. As clearly disclosed in the Specification, an object of the present invention to provide a quantum key distribution method and apparatus that can create a highly-secured common key while correcting data error on a transmission path by an error correction code having remarkably high characteristics. (*See pages 2-7 of the Specification*). Thus, it is respectfully submitted that this utility is also credible since a person of ordinary skill in the art would accept that the recited or disclosed invention is currently available for such use.

Accordingly, it is respectfully submitted that the claimed invention satisfies the three-pronged test of utility requirement, and thus, the claimed invention is supported by either a specific and substantial asserted utility or a well established utility.

B. The Examiner also alleges that claims 10 and 18 are directed toward an apparatus and method, which are different statutory categories. Applicants respectfully disagree. Both claims 10 and 18 are apparatus claim.

Note that claim 10 depends from claim 9, which is directed to a communication apparatus on transmission side that measures photons on a quantum communication path. Claim 10 further limits claim 9 by reciting more specific functionality of the check matrix creation unit.

Also note that claim 18 depends from claim 17, which is directed to a communication apparatus on reception side that transmits photons onto a quantum communication path an apparatus. Claim 18 further limits claim 17 by reciting more specific functionality of the check matrix creation unit.

According to MPEP 2173.05(g), a functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971).

Accordingly, it is respectfully submitted that claims 10 and 18 are directed only to an apparatus, not both apparatus and method as alleged by the Examiner.

Therefore, for at least the above reasons, it is respectfully requested to withdraw this rejection.

Rejection Under § 112, First Paragraph

Claims 10 and 18 are also rejected under 35 U.S.C. § 112, first paragraph. The Examiner alleges that the claimed invention is not supported by either a specific and substantial asserted utility or a well-established utility. As demonstrated above in great detail, both claims 10 and 18 are directed to a specific and substantial asserted utility or a well-established utility. Thus, it is

respectfully submitted that one skilled in the art clearly would know how to use the claimed invention. Accordingly, it is respectfully requested to withdraw this rejection.

35 U.S.C. § 103 REJECTION – Berzanskis, Yamazaki, Kou, Chung

At the outset, Applicants note that submitted herewith is a certified copy of the Japanese priority document, along with a certified English translation. Accordingly, Applicants hereby perfect the priority date of September 18, 2002.

Claims 1, 3-6, 9, 11-14, 17, 19-22 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Berzanskis et al. (U.S. Publication No. 2006/0059343 A1)[hereinafter “Berzanskis”] in view of Yamazaki (Institute of Electronics, Information and Communication Engineer’s Society Conference 2001)[hereinafter “Yamazaki”]. Claims 2, 7-8, 10, 15-16, 18, and 23-24 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Berzanskis in view of Yamazaki as applied to claims 1, 9 and 17 above, and further in view of Kou et al. (IEEE Globecom)[hereinafter “Kou”] and Chung et al. (IEEE Transactions on Information Theory)[hereinafter “Chung”]. Applicants respectfully traverse these rejections.

Applicants respectfully submit that the primary reference, Berzanski, does not qualify as prior art under 35 U.S.C. §102(e) since the earliest effective filing date of this reference is February 7, 2003 and the present invention has a perfected priority date of September 18, 2002. (See discussion above.)

Accordingly, Applicants respectfully request reconsideration and withdrawal of the obviousness rejections of claims 1, 3-6, 9, 11-14, 17, 19-22, based on Berzanski and Yamazaki, and claims 2, 7-8, 10, 15-16, 18, and 23-24, based on Berzanski and Yamazaki, Kou, and Chung.

CONCLUSION

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Ali M. Imam Reg. No. 58,755 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.147; particularly, extension of time fees.

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Respectfully submitted,


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FIG. 1

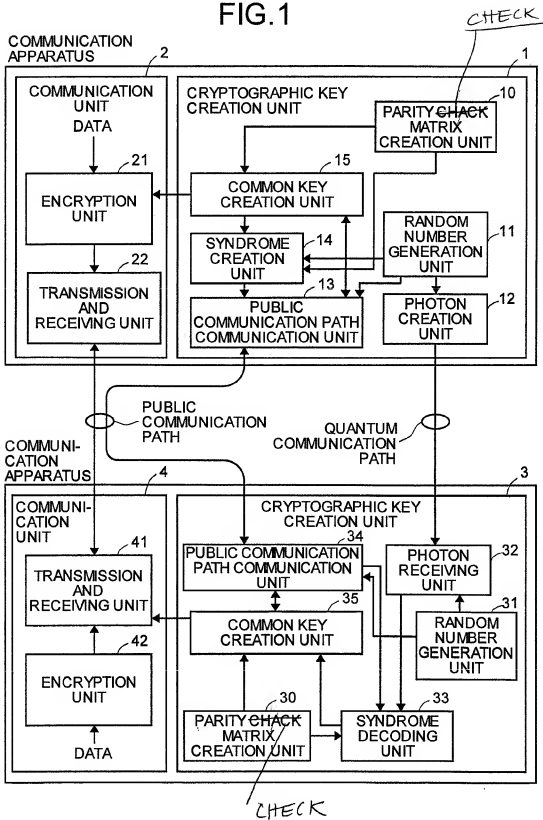


FIG.6

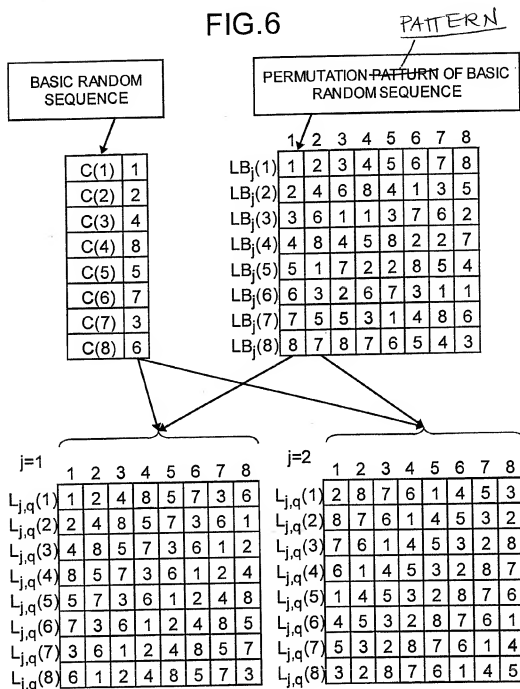


FIG. 7

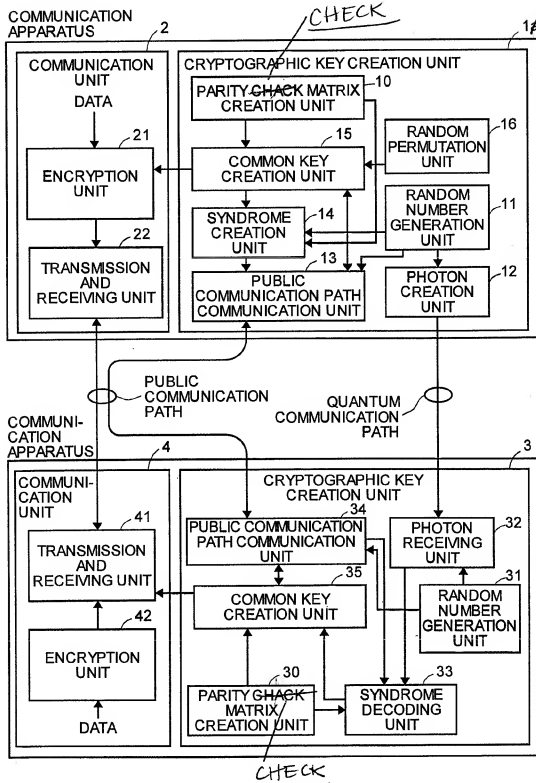
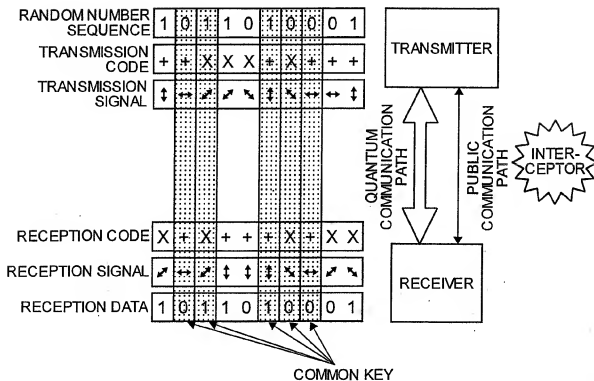


FIG.9



CONVENTIONAL ART